



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/785,616	02/23/2004	Gerd O. Mueller	LUM-03-11-07	2975

32566 7590 03/14/2006

PATENT LAW GROUP LLP
2635 NORTH FIRST STREET
SUITE 223
SAN JOSE, CA 95134

EXAMINER

KEANEY, ELIZABETH MARIE

ART UNIT PAPER NUMBER

2882

DATE MAILED: 03/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/785,616

Applicant(s)

MUELLER ET AL.

Examiner

Elizabeth Keaney

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 28-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,6-21 and 23-27 is/are rejected.
- 7) ☒ Claim(s) 3-5 and 22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Art Unit: 2882

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Group I in the reply filed on 15 December 2005 is acknowledged.

Claims 28-30 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group II, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 15 December 2005.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1,2,6,7 and 11-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Bawendi et al. (US Patent 6,501,091; hereinafter Bawendi).

Re claim 1: Bawendi discloses, in figure 1 and throughout the disclosure, a system comprising:

- a semiconductor light emitting device (10) capable of emitting first light having a first peak wavelength;

- a first fluorescent material layer (20) comprising a first wavelength converting material (22) capable of absorbing the first light and emitting second light having a second peak wavelength longer than the first peak wavelength (column 5, line 67); and
- a second fluorescent material layer (16) comprising a second wavelength converting material (18) capable of emitting third light having a third peak wavelength longer than the second peak wavelength (column 5, lines 63-64), wherein the second fluorescent material layer is disposed adjacent to the semiconductor light emitting device;
 - wherein at least one of the first fluorescent material layer and the second fluorescent material layer comprise a second material (12) that is not a wavelength material.

Re claim 2: Bawendi discloses, in figure 1 and throughout the disclosure, the second fluorescent material layer (16) overlies the semiconductor light emitting device (10) and the first fluorescent material layer (20) overlies the second fluorescent material layer.

Re claim 6: Bawendi discloses the quantum dots being suspended within a host matrix, rather than deposited in a solid layer. Therefore, Bawendi discloses the second fluorescent material layer being disposed on a plurality of discrete regions on the semiconductor light emitting device, and the first fluorescent material layer overlies the second fluorescent material layer.

Art Unit: 2882

Re claim 7: Bawendi discloses the first peak wavelength is blue; the second peak wavelength is green and the third peak wavelength is red (column 5, lines 56-67).

Re claim 11: Bawendi discloses the second material being selected from the group of resin, silicone, and silica (column 6, lines 64-67).

Re claim 12: Bawendi discloses the first fluorescent material layer and second fluorescent material layer are arranged to maximize a luminous equivalent of a combination of the first, second and third light (column 6, lines 4-7).

Re claim 13: Bawendi discloses the first fluorescent material layer and second fluorescent material layer are arranged to maximize color rendering index of a combination of the first, second and third light (column 6, lines 4-7).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bawendi.

Art Unit: 2882

Bawendi teaches all the limitations as shown above, including quantum dots having various emission peaks, specifically 594nm which is within the yellow emission range (column 5, lines 40-42). Bawendi further teaches mixing the quantum dots to produce the desired emission spectrum (column 6, lines 23-34).

Bawendi fails to explicitly teach the system include a second peak wavelength of yellow.

One of ordinary skill in the art would recognize the use of a yellow photoluminescent quantum dot to produce a desired light emission.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute a quantum dot that emits yellow for the quantum dot of Bawendi that emits green because it would produce the desired color emission.

Claims 1 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii et al. (US Patent 6,888,173; hereinafter Ishii) in view of Tomioka et al. (US Patent Application Publication 2002/0140891; hereinafter Tomioka).

Re claim 1: Ishii discloses, in figures 1 and 2 and throughout the disclosure, a system comprising:

- a semiconductor light emitting device (1) capable of emitting first light having a first peak wavelength;
- a first fluorescent material layer (8y or 8m) comprising a first wavelength converting material capable of absorbing the first light and emitting second

light having a second peak wavelength longer than the first peak wavelength; and

- a second fluorescent material layer (8c) comprising a second wavelength converting material capable of emitting third light having a third peak wavelength longer than the second peak wavelength, wherein the second fluorescent material layer is disposed adjacent to the semiconductor light emitting device.

Ishii further discloses forming the fluorescent material layers (color filters) by coating inks onto the protector (column 5, lines 6-10).

However, Ishii fails to teach or fairly suggest at least one of the first fluorescent material layer and the second fluorescent material layer comprising a second material that is not a wavelength converting material.

Tomioka discloses various ways of forming color filter layers including an ink jet method (the method of projecting a dye/pigment as an ink to form a pattern directly) (paragraph 66) and a pigment dispersion method (the method of coating a resin containing a pigment as a colorant) (paragraph 63).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the method of forming the color filter by pigment dispersion for the ink jet method taught by Ishii in order to produce a layer comprising a fluorescent material and a resin because the methods are art recognized equivalents of one another and considered to constitute an obvious design variation based on the

Art Unit: 2882

availability of manufacturing materials and apparatuses used in the manufacturing process.

Re claim 14: Ishii discloses, in figures 1 and 2 and throughout the disclosure, a third fluorescent material (8y) comprising a third wavelength converting material capable of emitting fourth light having a fourth peak wavelength.

Re claim 15: Ishii discloses the first peak wavelength to be UV, the second peak wavelength to be blue, the third peak wavelength to be red and the fourth peak wavelength to be green (column 2, lines 65-66 and column 3, lines 55-60).

Re claim 16: Ishii discloses, in figures 1 and 2 and throughout the disclosure, the second fluorescent material layer is adjacent (8c) to the semiconductor light emitting device; the third fluorescent material overlies the second fluorescent material (8m) and the first fluorescent material (8y) overlies the third fluorescent material.

Re claim 17: Ishii teaches all the limitations as shown above.

However, Ishii fails to explicitly teach the first fluorescent material layer comprising an amount of the second wavelength material.

One of ordinary skill in the art would recognize that where the first and second fluorescent material layer meet there will be some dispersion of particles between the layers. Therefore, the first fluorescent material layer would comprise a small amount of the second wavelength material.

Art Unit: 2882

It would have been obvious to one of ordinary skill in the art at the time the invention was made that the first fluorescent material layer would contain migrated fluorescent material of the second fluorescent material layer because without a prevention layer, no migration between layers is impossible.

Claims 18-21,23,24 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blanchard (US Patent 6,994,453) in view of Ishii.

Re claim 18: Blanchard discloses, in figure 5 and throughout the disclosure, a device comprising:

- at least one semiconductor light emitting device (74) capable of emitting first light having a first peak wavelength (column 12, lines 65-66);
- a cover plate (80) spaced apart from the at least one semiconductor light emitting device;
- a fluorescent material layer (78) that contains both red and green phosphors to produce white light from the emitted blue light of the semiconductor (column 13, lines 43-47);
 - wherein the fluorescent material layer is disposed on the cover plate.

However, Blanchard fails to teach or fairly suggest the fluorescent material layer comprising both red and green phosphors to be separate layers for each color.

Art Unit: 2882

Ishii discloses, in figures 1 and 2 and throughout the disclosure, the use of multiple fluorescent material layers, wherein each layer comprises only one phosphor color.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the fluorescent material layer of Blanchard by providing separate fluorescent material layer for each color because it allows for better color temperature to be achieved.

Re claim 19: Ishii discloses the third light combines with the first light and the second light to form mixed light that appears white (column 3, line 6).

Re claim 20: Ishii discloses the first fluorescent material layer and second fluorescent material layer are arranged to maximize a luminous equivalent of a combination of the first, second and third light (column 4, lines 16-22).

Re claim 21: Ishii discloses, in figures 1 and 2 and throughout the disclosure, one or more filters (8m or 8y).

Re claim 23: Ishii discloses, in figures 1 and 2 and throughout the disclosure, the first wavelength converting material (8y or 8m) and the second wavelength converting material (8c) are deposited as discrete layers.

Re claim 24: Ishii discloses, in figures 1 and 2 and throughout the disclosure, the second wavelength converting material (8c) is closer to the at least one semiconductor light emitting device than the first wavelength converting material.

Re claim 27: Blanchard discloses the device of claim 18 to further comprise an LCD (column 12, lines 39-41).

Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bawendi as applied to claim 1 above, and further in view of Jain et al. (US Patent 6,797,412; hereinafter Jain).

Bawendi teaches all the limitations as shown above, including quantum dots used as phosphorescent material producing red and green and/or yellow emission.

However, Bawendi fails to teach or fairly suggest the use of the specific phosphors included in claims 9 and 10.

Jain discloses the substitution of quantum dots for phosphor material (column 8, 32-33).

One of ordinary skill would recognize that since quantum dots are an improvement in the art upon phosphor material, interchanging phosphor material for quantum dots is a viable substitution.

One of ordinary skill would further recognize that the phosphors claimed in claims 9 and 10 are known phosphors used to produce red, green and yellow emission when blue light impinges on them. The use of the specific phosphors in claims 9 and 10

Art Unit: 2882

solves no long felt need or long-standing problem in the art. Accordingly, the choice of specific phosphors is considered to constitute an obvious design variation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the phosphors included in claims 9 and 10 within the device disclosed by Bawendi in order to produce the desired color emission and temperature based on the availability of phosphor material.

Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blanchard and Ishii.

Blanchard and Ishii teach all the limitations as shown above, including phosphors producing red and green emission dispersed within resin to produce the fluorescent material layers.

However, Blanchard and Ishii fail to teach or fairly suggest the specific phosphors claimed in claims 25 and 26.

One of ordinary skill would recognize that the phosphors claimed in claims 9 and 10 are known phosphors used to produce red and green emission when blue light impinges on them. The use of the specific phosphors in claims 9 and 10 solves no long felt need or long-standing problem in the art. Accordingly, the choice of specific phosphors is considered to constitute an obvious design variation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the phosphors included in claims 9 and 10

Art Unit: 2882

within the device disclosed by Blanchard and Ishii in order to produce the desired color emission and temperature based on the availability of phosphor material.

Allowable Subject Matter

Claims 3,4,5 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Re claim 3: The best prior art of record discloses a system comprising: a semiconductor light emitting device, a first fluorescent material layer, a second fluorescent material layer disposed adjacent to the semiconductor device, wherein at least one of the first fluorescent material layer and second fluorescent material layer comprise a second material that is not a wavelength converting material. However, the prior art fails to teach or fairly suggest a system wherein the first fluorescent material layer is disposed on a first portion of the semiconductor light emitting device, the second fluorescent material layer is disposed on a second portion of the semiconductor light emitting device and the first portion being adjacent to the second portion, as claimed in claim 3.

Art Unit: 2882

Re claims 4 and 5: The best prior art of record discloses a system comprising: a semiconductor light emitting device, a first fluorescent material layer, a second fluorescent material layer disposed adjacent to the semiconductor device, wherein at least one of the first fluorescent material layer and second fluorescent material layer comprise a second material that is not a wavelength converting material. However, the best prior art of record fails to teach or fairly suggest the first fluorescent material layer being disposed on a first plurality of discrete regions on the semiconductor light emitting device, and the second fluorescent layer is disposed on a second plurality of discrete regions on the semiconductor device, as claimed in claim 4. Claim 5 is allowable by virtue of its dependency.

Re claim 22: The best prior art of record discloses a system comprising: a semiconductor light emitting device, a cover plate spaced apart from the semiconductor light emitting device, a first fluorescent material layer, a second fluorescent material layer disposed adjacent to the semiconductor device, at least one of the first fluorescent material layer and second fluorescent material layer comprise a second material that is not a wavelength converting material and wherein the device further comprises one or more filters. However, the prior art fails to teach or fairly suggest a device wherein the first fluorescent material layer and second fluorescent material layer are arranged to maximize a gamut of color after the first, second and third lights are filtered by one or more filters, as claimed in claim 22.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- US Patent 6,565,233 discloses a light emitting device comprising color filters to produce white light emission.
- US Patent Application Publication 2005/0057145 discloses an LED producing white light emission.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Keaney whose telephone number is (571)272-2489. The examiner can normally be reached on Monday, Tuesday, Thursday, Friday 7:30-6:00.

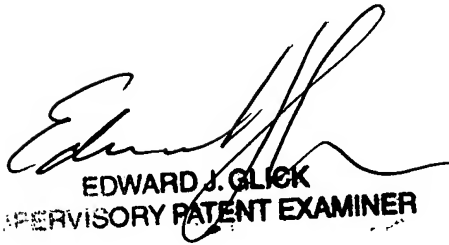
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571)272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Art Unit: 2882



Elizabeth Keaney
Examiner
Art Unit 2882



EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER